MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

PPC0116 – PRE-CALCULUS

(All Sections / Groups)

27 October 2017
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This examination paper consists of **5 printed pages** (including the cover page) with **4 questions only**.

2. Each question is worth **25 marks. Attempt ALL questions.**

3. Please write all your answers in the Answer Booklet provided. **Show all relevant steps** to obtain maximum marks.

Question 1 (25 marks)

(a) Express the following complex number in standard form (a + bi):

$$\frac{1}{1-i^5}-\frac{1}{\sqrt{-25}}$$

[4 marks]

(b) Solve the following equations and inequality:

(i) $5x^{-\frac{1}{5}}-3x^{-\frac{2}{5}}=2$ (Hint: Let $y=x^{-\frac{1}{5}}$) [4 marks]

(ii) $\sqrt{x-2}=\sqrt{2}-\sqrt{x}$ (Check your answer) [4 marks]

(iii) $\frac{x^2+3x+2}{x^2-2x+1}\geq 0$ [4 marks]

(c) Mary is 5 years younger than Janet. Three years later, Janet will be twice as old as Mary. Find their present ages. [4 marks]

(d) Jason jogs for 150 m diagonally across a rectangular field and then returns to his starting position along the outside of the field. Figure Q1 shows the path taken by Jason. The total distance he jogs is 360 m. What are the dimensions (length and width) of the field?

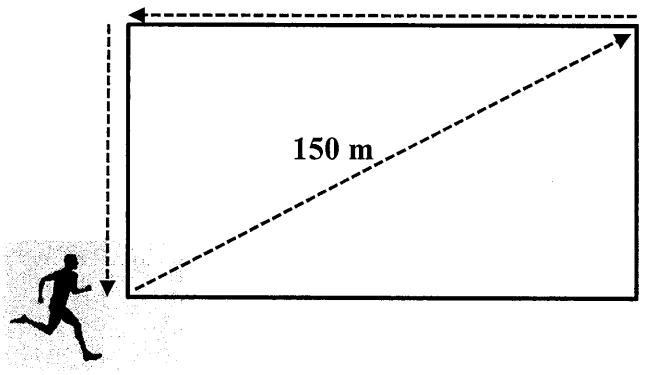

Figure Q1

[5 marks]

Continued...

Question 2 (25 marks)

(a) A circle that is tangent to the line whose equation is given by $x + y = 2$ has its center at (3, 5).

(i) Find the point of tangency. [4 marks]

(ii) Find the equation of the circle. [3 marks]

(b) Consider the function $f(x) = -x(2x-1)^2(x+2)$.

(i) Find the x-intercept(s) and y-intercept of the graph of f, if any. [2 marks]

(ii) Determine whether the graph of f crosses or touches x-axis at each x-intercept. [2 marks]

(iii) Determine the end behaviour of the graph of f. [1 mark]

(iv) Determine the maximum number of turning points on the graph of f. [1 mark]

(v) Determine the behaviour of the graph of f near each x-intercept. [3 marks]

(vi) Sketch the graph of f. [3 marks]

(c) Solve the following equations:

(i) $9^{2x+3} = \left(\frac{1}{27}\right)^{3x+1}$ [3 marks]

(ii) $\log_2(x+1) - \log_2(x-4) = 3$ [3 marks]

Continued...

Question 3 (25 marks)

(a) Given a function $f(x)=x^3+2x^2-5x-10$, use synthetic division to find the remainder if $f(x)$ is divided by $x+2$. Then, use the Factor Theorem to show that $x+2$ is indeed one of the factors for $f(x)$. [6 marks]

(b) Use long division to find the remainder when $6x^5-24x^3+3x+1$ is divided by $x-2$. Verify your answer using the Remainder Theorem. [7 marks]

(c) Given the rational function

$$f(x)=\frac{3x^3+2}{x^2-x-2},$$

use long division and partial fraction decomposition to show that $f(x)$ can be written in the form

$$f(x)=3(x+1)+\left[\frac{26}{3(x-2)}+\frac{1}{3(x+1)}\right].$$

[12 marks]

Continued...

Question 4 (25 marks)

(a) Consider the arithmetic series

$$10p + 20p + 30p + 40p + \ldots + 5000,$$

where p is a positive integer.

(i) Find an expression, in terms of p, for the number of terms in this series. [4 marks]

(ii) Find an expression, in terms of p, for the sum of the series. [3 marks]

(iii) If $p = 5$, find the sum of the last five terms of the series. [3 marks]

(b) The fifth and ninth terms of a geometric series are 256 and 16, respectively.

(i) Find the first term and common ratios of the series. [4 marks]

(ii) Will this series converge if the number of terms become infinite? If so, calculate the sum of the infinite series. [4 marks]

(c) (i) Find the first **FOUR** terms of the binomial expansion, in ascending powers of x, of $(1+x)^{10}$. [5 marks]

(ii) Using the binomial expansion in **(c)(i)**, find the approximate value of $(1.05)^{10}$. Give your answer to 4 decimal places. [2 marks]

End of Paper